Special Addendum

This addendum should be placed in the Installation and Wiring Instructions, 1252/IN 17, for any Model 521,522,523, or 524 SPECIAL C6.

DESCRIPTION

SPECIAL C6 is for Models 521,522,523, and 524 only.

Cold Junction Compensation resistor R2 (Balco) remains mounted and soldered on Main P.C.B. assembly A-11410-100.

An A-10334-001-X-XX Housing is recommended for a SPECIAL C6 controller.

Controller is UL listed.

August 19, 1980

Barber-Colman Company
INDUSTRIAL INSTRUMENTS DIVISION
1700 Rock Street, Rockford, Illinois, U.S.A., 61101

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SERIES 520 — Models 521, 522, 523 and 524
Analog and Digital Setpoint Controllers

AMBER LAMP ON CONTROLLERS
Either glows to indicate Output 1's solid state switching is on,
or
Steady glow if Output 1 is a current output, to indicate power is on to the instrument.

RED LAMP ON LIMITROL
Steady glow indicates selected setpoint is exceeded.

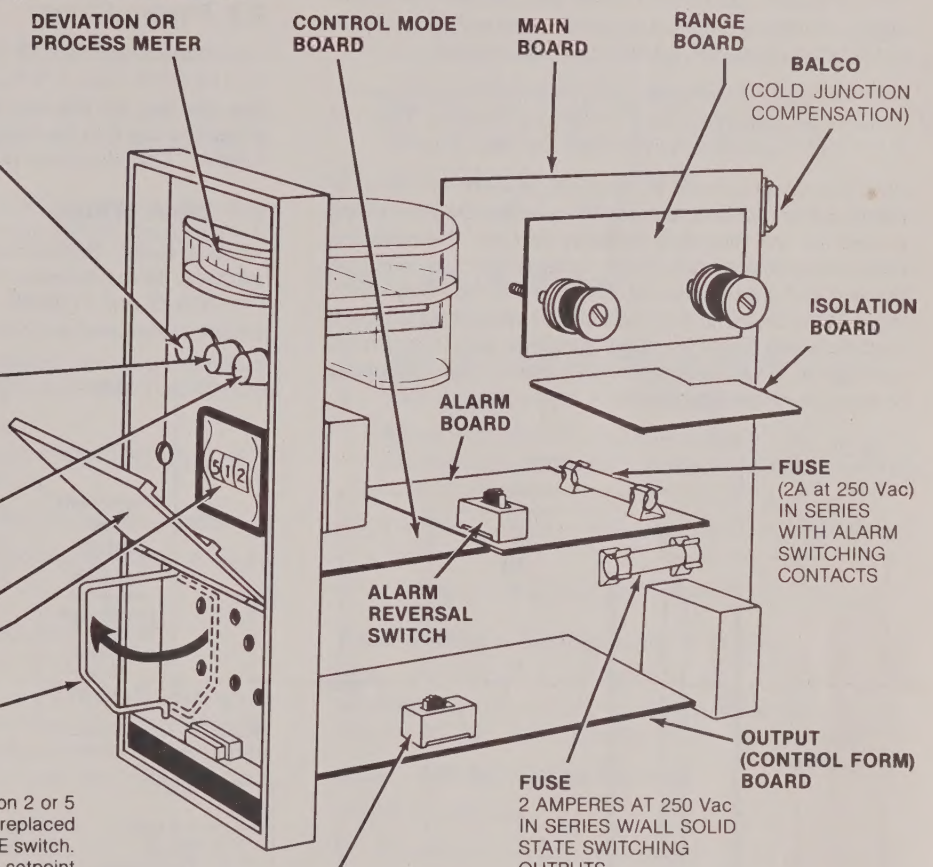
WHITE LAMP ON DUAL OUTPUT CONTROLLERS
Glows to indicate Output 2's solid state switching is on.

RESET PUSHBUTTON ON LIMITROL
Press to reset Limitrol after excess temperature drops below setpoint.

RED ALARM LAMP
Steady glow indicates an alarm.

DOOR SWUNG UP TO REVEAL CONTROL ADJUSTMENTS

DIGITAL SETPOINT HANDLE — Pull out to remove controller from its housing.


DEVIATION OR PROCESS METER
CONTROL MODE BOARD
MAIN BOARD
RANGE BOARD
BALCO (COLD JUNCTION COMPENSATION)
ISOLATION BOARD
ALARM BOARD
FUSE (2A at 250 Vac) IN SERIES WITH ALARM SWITCHING CONTACTS
ALARM REVERSAL SWITCH
OUTPUT (CONTROL FORM) BOARD
FUSE 2 AMPERES AT 250 Vac IN SERIES W/ALL SOLID STATE SWITCHING OUTPUTS
20 AMPERES AT 250 Vac IN SERIES WITH LIMITROL CONTACTS
OUTPUT 2 REVERSING SWITCH FOR ON-OFF OUTPUTS ONLY

NOTE: When either Setpoint Option 2 or 5 is specified, the red alarm lamp is replaced by the two position LOCAL-REMOTE switch. In the REMOTE position (down) the setpoint is an external setpoint on rear panel terminals 4 and 5. In the LOCAL position (up) the setpoint is determined by the setpoint control below the switch.

When Setpoint Option 7 is specified, the Setpoint is omitted.

When Setpoint Option 8 is specified, the Setpoint is replaced by a Trim Control which can be set to adjust the setpoint signal from a Master Controller ±5% of span.

Figure 2-1. Parts Description

WARNING
FUSE SIZE MUST NOT BE EXCEEDED. COPPER FOIL ON MAIN BOARD WILL BE DESTROYED AT HIGHER CURRENTS.

GAIN
Proportional Action Only: 10 to 100 (P.B.: 10 to 1%)
Proportional plus Integral Action: 1 to 100 (P.B.: 100 to 1%)
Derivative (Rate) Action does not affect the gain or P.B.

RATE (DERIVATIVE TIME)
0 to 3 Minutes

MANUAL RESET
0 to 100% output at null

AUTOMATIC RESET
.06 to 6 repeats per minute. CCW click off.

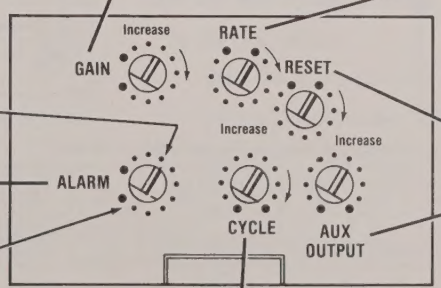
DEVIATION ALARM
Up to ±25% of span from setpoint

DEVIATION BAND ALARM
Adjustable from 3% to 50% of span centered about setpoint

PROCESS ALARM
0–100% of span

End opposite flat is the set position

Controls have flatted shafts



Determines separation of Output 1 and Output 2 on Dual Output Controllers from −25% to +25% of span from the setpoint selected on the Output 1 setpoint.

Output 2 is switch reversible. Only on models 522E, 523E, 524E, 522F, 523F, 524F, 522G, 523G, and 524G.

COOLING LIMIT ADJUSTMENT (located in the hole marked AUX OUTPUT). Continuously adjustable to limit the percent ON time between 5 (CCW) and 100 (CW). This prevents excess cooling. Only on models 522H, 523H, 524H, 522J, 523J, 524J, 522K, 523K, and 524K.

6 to 60 sec. B, E

10 to 30 sec. H, J, K

Figure 2-2. Functions of Internal Front Panel Controls

2.1 After Unpacking

Check the contents of the shipping container against the packing slip. If the equipment is damaged in transit, report the extent of the damage to the carrier immediately.

2.2 Mounting

The Series 520 can be mounted in any position. The instrument is rated for an ambient temperature from 5° to 55°C (40° to 130°F), and relative humidity from 0 to 70% RH.

Refer to Figure 2-3 for Panel Cutout and Mounting Dimensions. Dimensions guaranteed only if Certified Drawing, 1252 DR 4-1, is used. Consult factory to order Certified Drawing.

After the cutout is made in the panel, proceed as follows to install one instrument. Completely unscrew the two driving screws for the mounting brackets and pull the mounting brackets completely out of their tracks in the case. Place the housing in the panel cut-out. Replace the mounting brackets. Tighten the mounting bracket screws until the brackets hold the housing snugly against the panel. CAUTION: Do not over-tighten the mounting bracket screws — over-tightening screws could damage the panel.

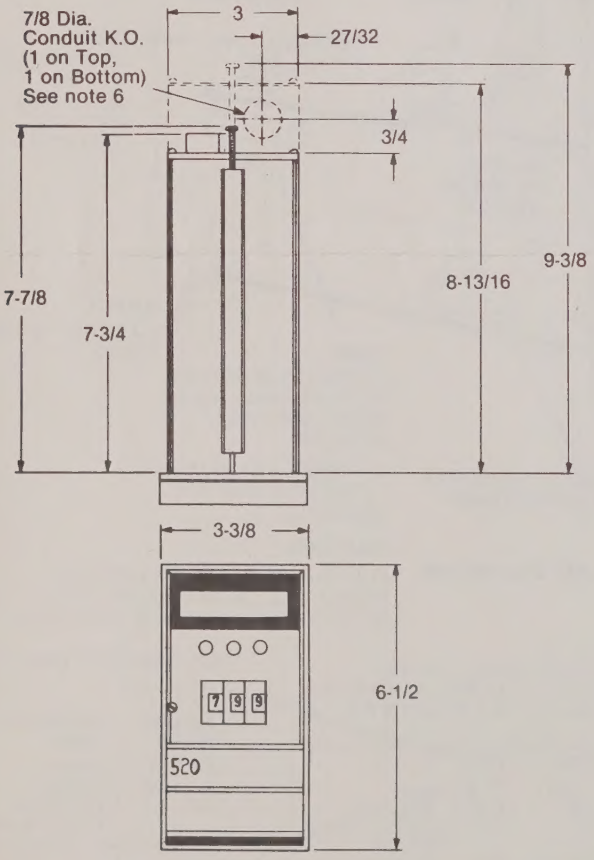
The captive screw on the left side of the panel in the middle is the fastener for the instrument. After the housing is mounted in the panel, push the controller firmly into its slot until the screw touches the threaded hole in back of it. Do not push instrument further but instead turn screw clockwise until instrument is pulled fully into its housing.

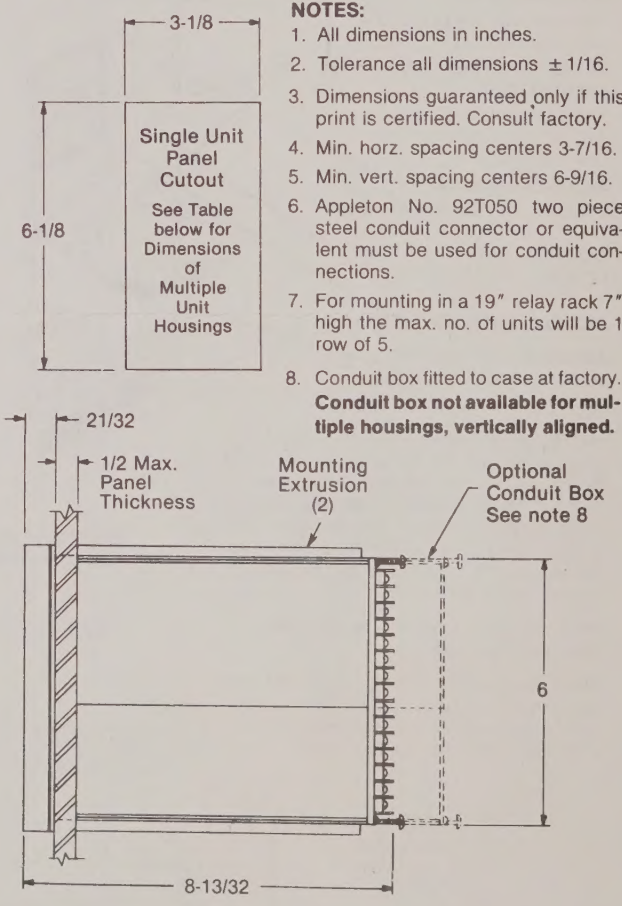
2.3 Power Wiring

Input line voltage must be 120 or 240 Vac, ±10%, at 60 Hz; or, 110 or 220 Vac, ±10%, at 50 Hz; by rear terminal selection. Connect the line voltage to the terminal marked L2 and either the terminal marked 240V L1 or the terminal marked 120V L1. Connect panel ground to the GROUND terminal.

2.4 Input Wiring

Install a quality Barber-Colman thermocouple for your application. Barber-Colman thermocouple catalogs, such as 1111/DB 12 and 1130/DB 1, list a complete line of thermocouple assemblies and thermocouple extension leadwire.





NOTES:

1. All dimensions in inches.
2. Tolerance all dimensions ±1/16.
3. Dimensions guaranteed only if this print is certified. Consult factory.
4. Min. horz. spacing centers 3-7/16.
5. Min. vert. spacing centers 6-9/16.
6. Appleton No. 92T050 two piece steel conduit connector or equivalent must be used for conduit connections.
7. For mounting in a 19″ relay rack 7″ high the max. no. of units will be 1 row of 5.
8. Conduit box fitted to case at factory. **Conduit box not available for multiple housings, vertically aligned.**

Number of Units Aligned Horizontally and Width in Inches

No. of Units Vertically Aligned	Height of Cutout in Inches	1	2	3	4	5	6	7	8	9
1	6-1/8	3-1/8	6-9/16	10	13-7/16	16-7/8	20-5/16	23-3/4	27-3/16	30-5/8
2	12-11/16	3-1/8	6-9/16	10	13-7/16	16-7/8	20-5/16	23-3/4	27-3/16	30-5/8

All Dimensions in Inches

Total Number of Units = Units Horizontal × Units Vertical

Examples:

1. Single Panelmount cutout is 3-1/8″ wide by 6-1/8″ high.
2. An array of 9 wide by 2 high, cutout is 30-5/8″ wide by 12-11/16″ high.
3. For one row of 5 housings, cutout is 16-7/8″ wide by 6-1/8″ high.

Note: Standard Relay Rack Panel Cutouts are made at the factory; and, the housings specified are shipped fastened to the panel. **See 1252/DB 3 for more information on Multiple Unit Housings.**

Figure 2-3. Mounting Dimensions

The SIGNAL input terminals are marked TC + and TC – and are for any input.

Thermocouples should never be wired using ordinary copper wire. Use only thermocouple extension leadwire.

Observe the correct thermocouple and thermocouple extension wire polarity. The NEGATIVE (–) wire is usually coded RED.

Do not place power wiring and thermocouple wiring in the same conduit or wiring trough.

If shielded thermocouple leads are used, shields should be insulated electrically and terminated at one location, preferably the instrument chassis.

For RTD sensors there is no polarity to observe. For three wire RTD sensors, connect the two WHITE wires together.

2.5 Alarms

2.5.1 General

These alarms are not recommended for safety purposes. For safety purposes the Models 521L and 521T Limitrols are recommended.

Alarm boards in the Series 520 are shipped from the factory with the following wiring conditions:

1. Alarm light is on when alarm relay is de-energized.
2. Normally open alarm contact is connected to instrument alarm terminals.

2.5.2 ALARM Potentiometer and Alarm Reversal Switch

Either a Process, a Deviation, or a Deviation Band Alarm may have been specified. The alarm action is determined by the front panel ALARM pot and by a slideswitch located on the Alarm Board. Figure 2-1 shows the location of the switch.

Set the switch as follows.

Process Alarm: pull out to alarm* on decreasing signal, push in to alarm* on increasing signal.

Deviation Alarm: pull out to alarm* on decreasing signal, push in to alarm* on increasing signal.

Deviation Band Alarm: push in to alarm* inside the bandwidth, pull out to alarm* outside the bandwidth,

*"to alarm" means that terminals 6 and 7 open.

Next, set the ALARM potentiometer.

The Process Alarm can be set to trip anywhere within the span of the instrument (0 to 100% of span) by means of the 20-turn ALARM potentiometer. Turn the ALARM pot clockwise to increase the alarm trip point.

The Deviation Alarm can be set to trip up to ±25% of span from setpoint by means of the single turn ALARM potentiometer. With the ALARM pot turned fully CCW the alarm will trip at a deviation of 25% of span below setpoint.

With the ALARM pot fully CW the alarm will trip at a deviation of 25% of span above the setpoint.

The Deviation Band Alarm can be set to trip from plus and minus 1.5% of span about setpoint to plus and minus 25% of span about setpoint. Total bandwidth is adjustable from 3% to 50% of span centered about setpoint. Rotating the single-turn ALARM pot clockwise (CW) widens the deviation band.

2.5.3 Setting a Deviation Alarm Trip Point

2.5.3.1 With Millivolt Source Input

Proceed as follows.

1. Disconnect any input or output.
2. Turn power on to the Series 520.
3. Connect a d-c millivolt source (B-C Portable Potentiometer output) to the SIGNAL input terminals. Increase the millivolt input signal until it is above (below for a low deviation alarm) midscale and the difference between the signal and midscale is the desired deviation.
4. Adjust the setpoint to midscale.
5. Turn the ALARM potentiometer until the red alarm lamp lights.

2.5.3.2 With Process Input

Proceed as follows.

1. Allow the process to stabilize at the desired setpoint.
2. Quickly perform steps 3, 4 and 5 that follow.
3. Adjust the setpoint until it is below (above for a low deviation alarm) the desired setpoint mentioned in step 1, by the amount of the alarm deviation.
4. Turn the ALARM potentiometer until the red alarm lamp lights.
5. Quickly return setpoint to the value it had in step 1.

2.5.4 Setting a Deviation Band Alarm

With the Deviation Band Alarm option, when the ALARM potentiometer is fully CW, the bandwidth is 50% of span. When fully CCW, the bandwidth is about 3% of span.

2.5.4.1 With Millivolt Source Input

Proceed as follows.

1. Disconnect any input or output.
2. Turn power on to the Series 520.
3. Connect a d-c millivolt source (B-C Portable Potentiometer output) to the SIGNAL input terminals. Increase the millivolt input signal until it is above (or below) midscale and the difference between the signal and midscale is half the desired bandwidth.
4. Adjust the setpoint to midscale.
5. Turn ALARM potentiometer until red lamp lights.

2.5.4.2 With Process Input

Proceed as follows.

1. Allow the process to stabilize at the desired setpoint.
2. Quickly perform steps 3, 4 and 5 that follow.
3. Adjust the setpoint until it is above (or below) the desired setpoint mentioned in step 1, by the amount of half the bandwidth.
4. Turn the ALARM potentiometer until the red alarm lamp lights.
5. Quickly return setpoint to the value it had in step 1.

2.5.5 Setting a Process Alarm Trip Point

Proceed as follows.

1. Disconnect any input or output.
2. Turn power on to the Series 520.
3. Connect a d-c millivolt source to the SIGNAL input terminals. Adjust the millivolt input signal to the equivalent of the desired alarm temperature.
4. Turn the ALARM potentiometer until the red alarm lamp lights.

2.5.6 Re-connecting the Red Alarm Lamp to Indicate a Safe Condition

Do not make this wiring change for a safety related application. This wiring condition is suitable for such purposes as the following: indicating that temperature is normal, furnace or extruder is ready to operate, extruder barrel temperature is at required temperature, zone temperature on furnace or extruder is at required temperature.

To make this wiring change refer to Figure 2-4 and proceed as follows. A black lead from the red alarm lamp is connected to terminal D on the Alarm Board. Disconnect the black lead from terminal D and connect it to the adjacent terminal E.

2.5.7 Re-connecting the Normally Open Alarm to Normally Closed

Do not make this wiring change for a safety related application. This wiring condition is suitable for such purposes as the following: programming and sequencing.

To make this wiring change refer to Figure 2-4 and proceed as follows. A gray wire from the printed circuit board connector number 11 is connected to terminal B. Disconnect the gray wire from terminal B and connect it to terminal A.

2.6 Reversing the ON-OFF Output — Model 521A

— IMPORTANT —

INSTRUMENT MUST HAVE BEEN ORDERED WITH DOWNSCALE TCB (THERMOCOUPLE BREAK ACTION) IN ORDER TO MAKE THIS CHANGE.

The Model 521A is shipped with pin A connected to pin B by means of a jumper; and, with pin C connected to pin D by means of a jumper.

To reverse the ON-OFF output, make the jumper connections shown in Figure 2-5; that is, connect pin C to pin B, and connect pin A to pin D.

2.7 Changing Limitrol Output from High Limit to Low Limit — Models 521L and 521T

— IMPORTANT —

INSTRUMENT MUST HAVE BEEN ORDERED WITH DOWNSCALE TCB (THERMOCOUPLE BREAK ACTION) IN ORDER TO MAKE THIS CHANGE.

The Model 521L is shipped with pin A connected to pin B by means of a jumper; and, with pin C connected to pin D by means of a jumper. This is an "upscale" Limitrol.

To change to a "downscale" Limitrol make the jumper connections shown in Figure 2-5; that is, connect pin C to pin B, and connect pin A to pin D.

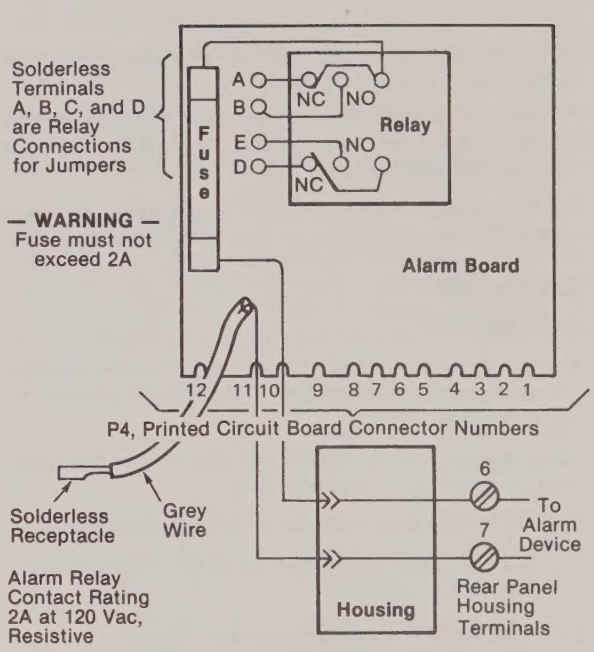


Figure 2-4. Alarm Wiring

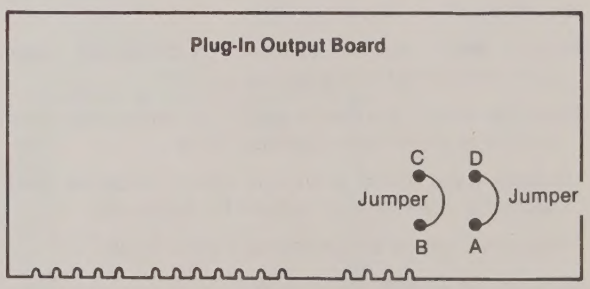
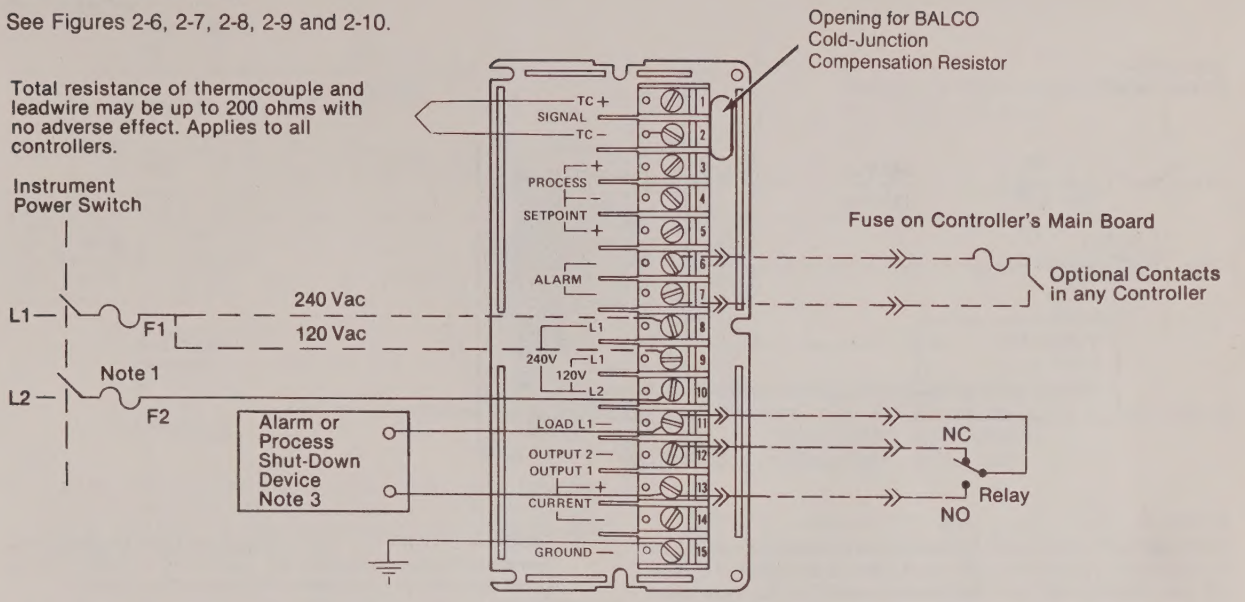


Figure 2-5. Jumpers

2.8 Output Wiring

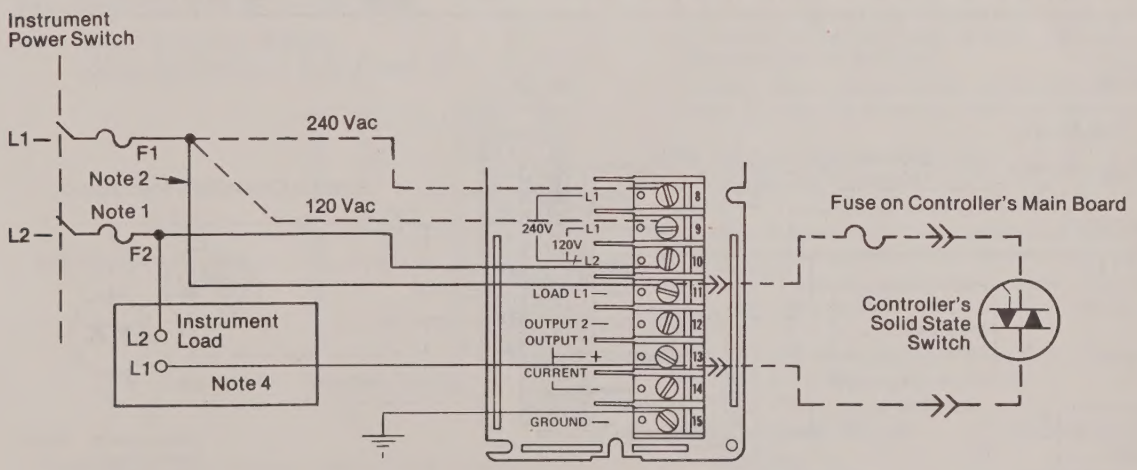
See Figures 2-6, 2-7, 2-8, 2-9 and 2-10.



Notes:

1. Instrument power switch and instrument fuses are included for illustrative purposes only. If the L2 line is a neutral or ground line, fuse F2 is not normally recommended. Consult local codes and appropriate wiring standards.
2. Limitrol Relay Contact Ratings: 5A at 120 or 240 Vac.
3. Power connections are made at the discretion of the installer.

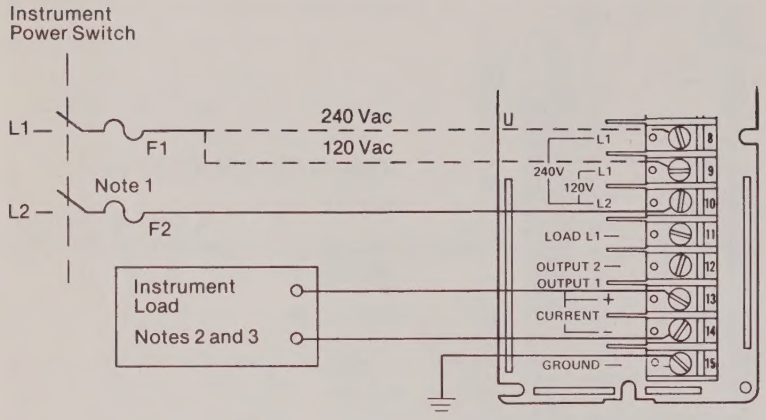
Figure 2-6. Output Wiring, Limitrol Models 521L and 521T



Notes:

1. Instrument power switch and instrument fuses are included for illustrative purposes only. If the L2 line is a neutral or ground line, fuse F2 is not normally recommended. Consult local codes and appropriate wiring standards.
2. Instrument load power, LOAD L1, may be obtained from a separate power source in phase with the instrument power supply. Instrument signal light will not operate unless instrument L2 and instrument load L2 are connected as shown. Instrument signal light will not operate if LOAD L1 is powered by a separate source of less than 100 Vac rms.
3. Instrument load may be either a contactor coil, a Barber-Colman SOLID STATE CONTACTOR, or heater.
4. Rating of Solid State Switching Output: (both ON-OFF and Time-Proportioning): 1A continuous, 10A inrush, 50mA minimum. Any voltage from 24 Vac to 240 Vac can be switched but the voltage switched must be the same phase and have the same common line as the instrument power supply.

Figure 2-7. Output Wiring, Single Solid State Switching Output Models 521A and 522B, 523B, 524B

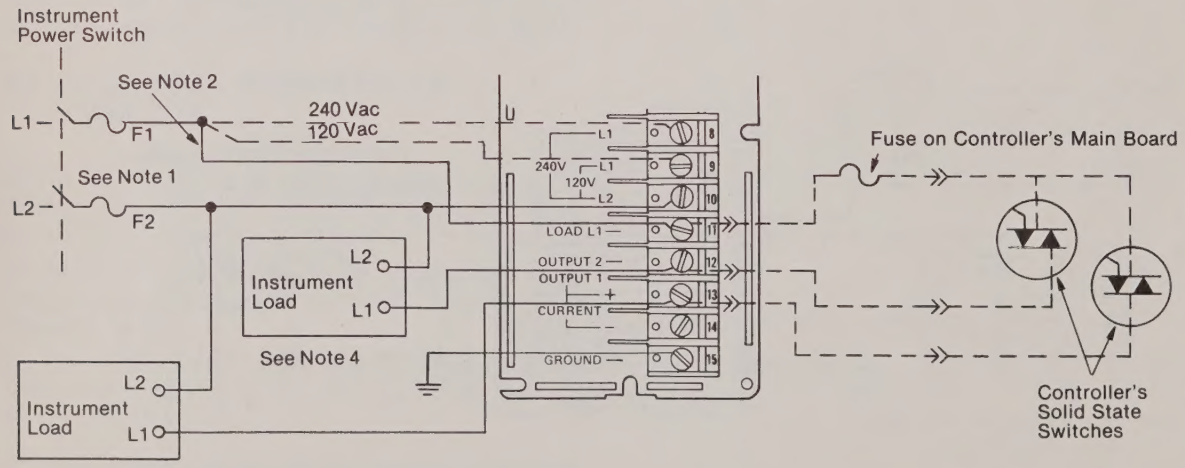


Notes:

1. Instrument power switch and instrument fuses are included for illustrative purposes only. If the L2 line is a neutral or ground line, fuse F2 is not normally recommended. Consult local codes and appropriate wiring standards.
2. The constant current outputs of these controllers are short circuit proof. Either plus or minus may be grounded or remain floating.
3. Either the 2–12mA or 4–20mA output will drive the Model 658 Current-to-Position Converter for positioning a Barber-Colman Motor Operator or a Current-to-Pneumatic Transducer.

   Either current output will drive Barber-Colman Power Controllers.
4. Current Output: either 2–12mA into 1.5k ohms or less; or 4–20mA into 750 ohms or less.

Figure 2-8. Output Wiring, Single Current Output Models, 522C, 523C, 524C and 522D, 523D, 524D 522P, 523P, 524P and 522Q, 523Q, 524Q



Notes:

1. Instrument power switch and instrument fuses are included for illustrative purposes only. If the L2 line is a neutral or ground line, fuse F2 is not normally recommended. Consult local codes and appropriate wiring standards.
2. Instrument load power, LOAD L1, may be obtained from a separate power source in phase with the instrument power supply. Instrument signal light will not operate unless instrument L2 and instrument load L2 are connected as shown. Instrument signal light will not operate if LOAD L1 is powered by a separate source of less than 100 Vac rms.
3. Instrument load may be either a contactor coil, a Barber-Colman SOLID STATE CONTACTOR, or heater.
4. Rating of Solid State Switching Output: (both ON-OFF and Time-Proportioning): 1A continuous, 10A inrush, 50mA minimum. Any voltage from 24 Vac to 240 Vac can be switched but the voltage switched must be the same phase and have the same common line as the instrument power supply.

Figure 2-9. Output Wiring, Dual Solid State Switching Outputs. Models 522E, 523E, 524E and 522H, 523H, 524H

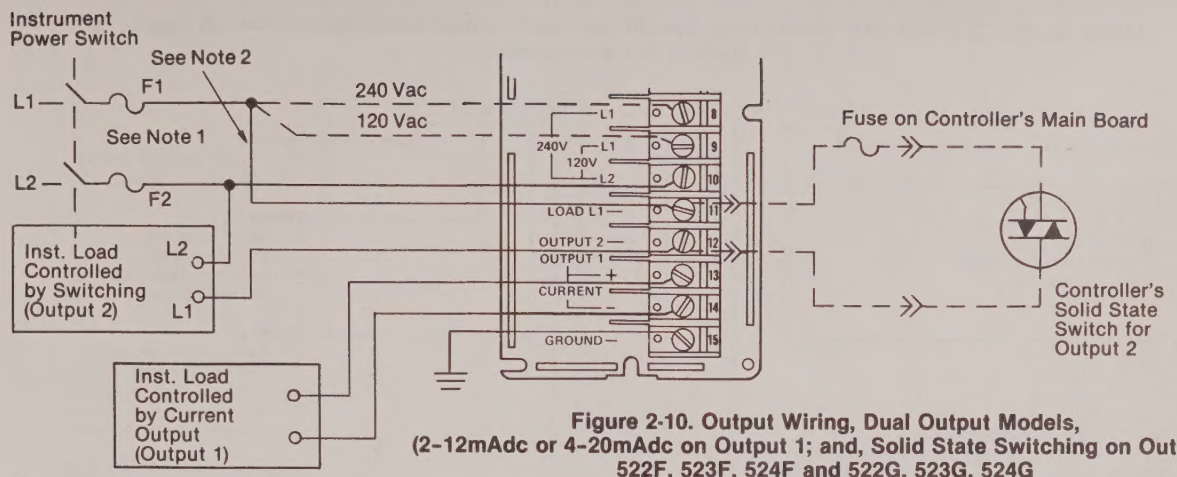


Figure 2-10. Output Wiring, Dual Output Models, (2-12mAdc or 4-20mAdc on Output 1; and, Solid State Switching on Output 2) 522F, 523F, 524F and 522G, 523G, 524G 522J, 523J, 524J and 522K, 523K, 524K

Notes:

1. Instrument power switch and instrument fuses are included for illustrative purposes only. If the L2 line is a neutral or ground line, fuse F2 is not normally recommended. Consult local codes and appropriate wiring standards.
2. OUTPUT 1: The constant current outputs of these controllers are short circuit proof. Either plus or minus may be grounded or remain floating.

   Either the 2-12mA or 4-20mA output will drive the Model 658 Current-to-Position Converter for positioning a Barber-Colman Motor Operator or a Current-to-Pneumatic Transducer.

   Either current output will drive Barber-Colman Power Controllers.

   Current Output: either 2-12mA into 1.5k ohms or less; or 4-20mA into 750 ohms or less.
3. OUTPUT 2: Instrument load power, LOAD L1, may be obtained from a separate power source in phase with the instrument power supply. Instrument signal light will not operate unless instrument L2 and instrument load L2 are connected as shown. Instrument signal light will not operate if LOAD L1 is powered by a separate source of less than 100 Vac rms.

   Instrument load may be either a contactor coil, a Barber-Colman SOLID STATE CONTACTOR, or heater.

   Rating of Solid State Switching Output: (both ON-OFF and Time-Proportioning): 1A continuous, 10A inrush, 50mA minimum. Any voltage from 24 Vac to 240 Vac can be switched but the voltage switched must be the same phase and have the same common line as the instrument power supply.

2.9 Setpoint Wiring — Isolated

2.9.1 Input Setpoint Wiring (Setpoint Options 2, 5, 7 and 8)

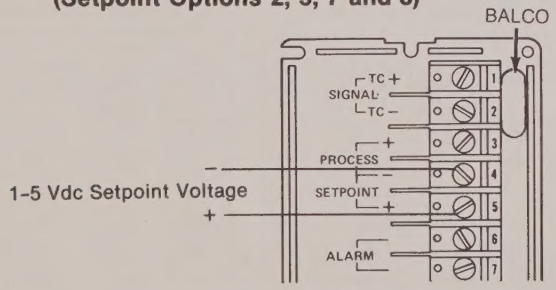


Figure 2-11. Setpoint Wiring

Notes:

1. **Options 2 or 5:** Setpoint with Remote-Local Switch.

   Source should be free of transients and have an impedance less than 200 ohms. For operation of more than one controller from the same external source, a source resistance under 50 ohms is recommended. Typical input impedance of 1 meg ohm.

   A REMOTE-LOCAL switch on the front panel allows the setpoint source to be either the front panel setpoint or the remote setpoint. For start-up or servicing the instrument may be switched to local setpoint operation. After start-up or servicing, control is returned to the remote setpoint.
2. **Option 7:** No Setpoint, requires remote setpoint voltage.

   Source should be free of transients and have an impedance less than 200 ohms. For operation of more than one controller from the same external source, a source resistance under 50 ohms is recommended.
3. **Option 8:** Trim Setpoint

   Requires 1-5 Vdc Setpoint Voltage from an external source. Source resistance up to 20 ohms.

   The Trim Control, located in place of the Digital Setpoint, adjusts the remote 1-5 Vdc input setpoint signal ±5% of span. Typical input impedance is 20k ohms.

   The input setpoint signal is usually trimmed to either correct for sensor difference or to select a desired temperature profile.

2.9.2 Output Setpoint Wiring (Setpoint Options 3 or 6)

1-5 Vdc proportional to instrument setpoint span. Short circuit has no effect on control action. Source resistance less than 10 ohms.

The Series 520 operates as a Master Controller which can transmit a 1-5 Vdc output setpoint voltage to many multiple Slave Controllers.

Maximum total output current of Process Signal Output option plus Output Setpoint Voltage option is 10 mAdc.

2.10 Process Signal Wiring — Isolated

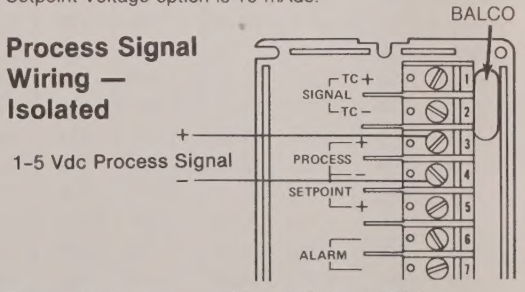


Figure 2-12. Process Signal Output Wiring (Setpoint Options 2, 3, 5, 6, 7 and 8)

External short circuit has no effect on control action. Source resistance less than 10 ohms.

Setpoint options 2, 3, 5, 6, 7 and 8 include Interface Signal Isolation. This means that the Process Signal and Setpoint Signal Outputs are isolated from the signal input terminals. There is also Input-Output Isolation.

Model number located under access door. Specify complete 15-digit model number on any inquiry to Barber-Colman Company.

52□□ - □ □□□□ - □□□ - □ - □□

Series

Control Mode
1 — ON-OFF or Limitrol (only with A, L or T below)
2 — Proportional Controller
3 — Proportional + Integral (Reset)
4 — Proportional + Integral + Derivative (Rate)

Output Control Form
A — ON-OFF (only with 1 above)
B — Time Proportioning
C — Current: 2-12 mA, Reverse Acting
D — Current: 4-20 mA, Reverse Acting
E — Dual—Time Proportioning and on-off auxiliary output
F — Dual—Current 2-12 mA and on-off auxiliary output
G — Dual—Current 4-20 mA and on-off auxiliary output
H — Dual—Time Proportioning on both outputs
J — Dual—Current 2-12 mA and Time Proportioning auxiliary output
K — Dual—Current 4-20 mA and Time Proportioning auxiliary output
L — Limitrol (only with 1 above)
P — Current: 2-12 mA, Direct Acting
Q — Current: 4-20 mA, Direct Acting
T — Limitrol (only with 1 above)

Setpoint
1 — Analog Setpoint
2 — Analog Setpoint with Remote-Local Switch
3 — Analog Setpoint with output setpoint voltage available
4 — Digital Setpoint (standard)
5 — Digital Setpoint with Remote-Local Switch
6 — Digital Setpoint with output setpoint voltage available
7 — None. Requires remote setpoint voltage
8 — Trim Setpoint. Requires remote setpoint voltage
9 — Other

Setpoint options **2, 3, 5, 6, 7** and **8** include a Process Signal Output

Range Code
Four Digit Range Code

Input Signal
0 — Thermocouple Upscale TCB
1 — Thermocouple Downscale TCB
2 — Resistance Bulb
4 — Vdc (above 0.1 Vdc)
5 — mAdc
6 — Radiation Pyrometer Emissivity Correction
8 — mVdc (below 100 mVdc)
9 — Other

Readouts
1 — Deviation Meter (standard)
3 — Process Meter
5 — Digital Process Meter
7 — Deviation Meter with 1.8 inch Scale

Housing
0 — Panelmount (standard)
1 — Shipped without housing—order housing separately
2 — Panelmount with conduit openings and rear cover

Specify **1** above and see 1252 DB 3 to order high density housings for either Panel or Standard Relay Rack Mounting.

Alarms
0 — None (standard)
1 — Deviation Alarm
2 — Deviation Band Alarm
3 — Process Alarm

Specials
00 — None. Consult factory for all Specials

All of the models include, as standard, indicator lights appropriate to the output form selected.

CALIBRATION CHARTS, DIGITAL SETPOINT ONLY

0 TO 799°F/J
DIGITAL RANGE CODE 0016

True Temp °F	Dial Setting or DPM Reading	Setpoint Voltage	Input mV
0	12	1.059	-0.89
50	57	1.286	0.51
100	104	1.520	1.94
150	152	1.759	3.41
200	200	2.003	4.91
250	250	2.250	6.42
300	299	2.499	7.95
350	349	2.749	9.48
400	400	3.000	11.02
450	450	3.252	12.57
500	500	3.503	14.11
550	550	3.754	15.65
600	600	4.005	17.19
650	650	4.255	18.72
700	700	4.505	20.25
750	750	4.755	21.78
799	799	5.000	23.29

0 TO 598°F/J
DIGITAL RANGE CODE 0015

True Temp °F	Dial Setting or DPM Reading	Setpoint Voltage	Input mV
0	10	1.069	-0.89
25	33	1.219	-0.20
50	56	1.373	0.51
75	79	1.528	1.22
100	103	1.686	1.94
125	127	1.846	2.67
150	151	2.007	3.41
175	175	2.170	4.16
200	200	2.333	4.91
225	224	2.498	5.66
250	249	2.664	6.42
275	274	2.830	7.18
300	299	2.997	7.95
325	324	3.165	8.71
350	349	3.333	9.48
375	375	3.501	10.25
400	400	3.669	11.02
425	425	3.838	11.79
450	450	4.006	12.57
475	475	4.175	13.34
500	501	4.343	14.11
525	526	4.511	14.88
550	551	4.679	15.65
575	576	4.847	16.42
598	599	5.000	17.12

200 TO 1190°F/J
DIGITAL RANGE CODE 0203

True Temp °F	Dial Setting or DPM Reading	Setpoint Voltage	Input mV
200	202	1.010	4.91
250	251	1.206	6.42
300	301	1.404	7.95
350	351	1.603	9.48
400	401	1.803	11.02
450	451	2.003	12.57
500	501	2.203	14.11
550	550	2.403	15.65
600	600	2.603	17.19
650	650	2.802	18.72
700	700	3.000	20.25
750	749	3.199	21.78
800	799	3.398	23.32
850	849	3.597	24.85
900	899	3.797	26.40
950	949	3.999	27.95
1000	1000	4.202	29.52
1050	1051	4.407	31.10
1100	1103	4.616	32.71
1150	1156	4.827	34.34
1190	1199	5.000	35.67

0 TO 1999°F/K
DIGITAL RANGE CODE 0030

True Temp °F	Dial Setting or DPM Reading	Setpoint Voltage	Input mV
0	13	1.027	-0.69
100	109	1.217	1.52
200	208	1.415	3.82
300	305	1.611	6.09
400	401	1.803	8.31
500	498	1.996	10.56
600	597	2.194	12.85
700	697	2.394	15.18
800	798	2.596	17.52
900	899	2.800	19.88
1000	1001	3.004	22.25
1100	1103	3.208	24.62
1200	1205	3.411	26.98
1300	1305	3.612	29.31
1400	1405	3.812	31.63
1500	1504	4.009	33.91
1600	1601	4.203	36.17
1700	1696	4.394	38.39
1800	1790	4.583	40.58
1900	1883	4.768	42.73
1999	1974	4.950	44.83

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Barber-Colman Company
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MP MASTER
MA32144